forming an upper electrode layer on said PZT ferroelectric film, wherein said step of crystallizing said PZT ferroelectric film is conducted by setting a composition of said atmosphere such that said atmosphere contains said oxidizing gas with a fraction of 1 to [50] 20% in volume.

15. (Twice Amended) A semiconductor device, comprising:

a substrate;

an active device element formed on said substrate;

an insulation film provided over said substrate to cover said active device element;

a lower electrode containing Pt provided over said insulation film;

a PZT ferroelectric film provided on said lower electrode, said PZT ferroelectric film having a columnar microstructure extending from an interface between said lower electrode and said PZT ferroelectric film in a direction substantially perpendicular to a principal surface of said lower electrode, said PZT ferroelectric film essentially consisting of crystal grains having a generally uniform grain diameter of less than about 200 nm; and

an upper electrode provided on said PZT ferroelectric film.

21. (Twice Amended) A method of fabricating a semiconductor device having a ferroelectric capacitor, comprising the steps of:

forming an active device element on a substrate;

forming an insulation film over said substrate to cover said active device element;

forming a lower electrode layer of said ferroelectric capacitor over said insulation film;

forming [a] an amorphous PZT ferroelectric film on said lower electrode layer as a capacitor insulation film of said ferroelectric capacitor;

crystallizing said amorphous PZT ferroelectric film by applying a thermal annealing process in an atmosphere containing a non-oxidizing gas and an oxidizing gas; and

forming an upper electrode layer on said PZT ferroelectric film, wherein said step of crystallizing said PZT ferroelectric film is conducted by setting the composition of said atmosphere such that said atmosphere